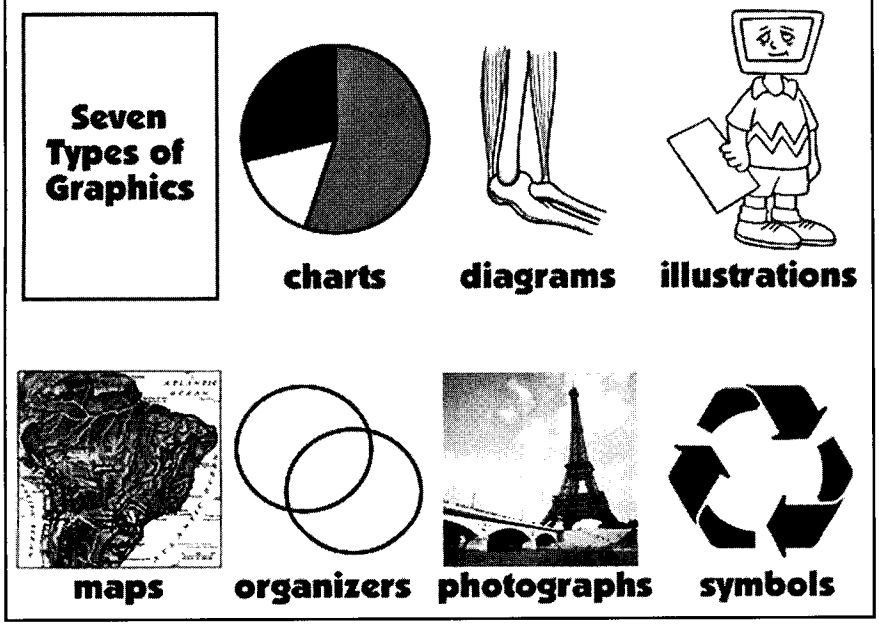
KEY WORDS IN INSTRUCTION

Graphic Inquiry: Standards and Resources, Part I

by Daniel Callison and Annette Lamb

Graphic inquiry involves extracting information from and presenting information in visual formats such as political cartoons, diagrams, maps, photos, charts, tables, and multimedia. Through a recursive process of questioning, exploration, assimilation, inference, and reflection, student information scientists and their instructional specialists use graphic inquiry as a means to answer questions, draw conclusions, solve problems, and make decisions.

Figure 1



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Types of Graphics

Graphics are visual representations created on paper, the computer screen, or other surfaces to communicate information. Although graphics may simply provide a visual illustration of a concept, they often include numbers, words, and other symbols. Graphics may also represent fiction or nonfiction content. For example, an artist may create a 3-D picture of a fantasy world using imaging software, while a geologist may draw and label a cross section of a mountain.

Since graphics are used in many different contexts and involve overlaying techniques, it is, therefore, difficult to create a definitive list with distinct divisions. General categories are listed as follows (see Figure 1):

Charts. Numeric data are often represented using charts and graphs. Charts allow large quantities of data to be presented in a single visual. Bar charts, histograms, line charts, pie charts, and scatter plots are a few examples.

Diagrams. A simplified visual representation of an object, concept, or idea is often called a diagram. It is usually a line drawing and provides a quick reference to information that would otherwise be complex and difficult to understand. Diagrams often show the re-

lationships among parts and wholes such as the anatomy of the human body or how something works such as the operation of a machine.

Illustrations. Drawings, paintings, sketches, and etchings are examples of illustrations. These visual representations are intended to communicate an informational or artistic message. In the case of an editorial cartoon, the message is often social or political. In graphic novels and picture books, illustrations are used to tell the story. Technical drawings provide accurate representations of objects used by architects, engineers, and machinists.

Maps. A map is a simplified, visual representation of the relationships among objects within a space and depicts a geographic location. Maps have traditionally represented three-dimensional space in two dimensions on paper. However, today's 3-D software and satellite imaging tools allow developers to visualize three dimensions.

Organizers. Mind maps, chains, webs, spider maps, decision trees, flowcharts, matrix, timelines, story maps, Venn diagrams, and KWL charts are a few examples of graphic organizers. These tools help students identify and classify information, so they can visualize the relationships and connections among these ideas, concepts, or issues.

Photographs. A photograph is simply a visual record of a moment in time and place. A photographer composes this visual record through techniques such as angle, field of view, and depth of field. Scanned images and photocopied visuals are also in this category.

Symbols. Symbols provide a simple visual representation and are used to represent abstract ideas or concepts. Pictograms, picture language, logos, icons, and traffic signs are a few examples.

Graphic Inquiry Found in Content Knowledge Standards

In addition to an obvious relationship with the information literacy standards for student learning promoted by the American Association of School Librarians, graphic inquiry can be found across all grade levels and subject disciplines. Examples drawn from *Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education* endorsed by the Association for Supervision and Curriculum Development are as follows (Kendall and Marzano 2000):

These standards support the following uses of graphics:

Document, argue, and persuade in order to make information more convincing.

Language Arts, grades 3–5. The student understands basic elements of advertising in visual media (e.g., sales approaches and techniques aimed at children, appealing elements used in memorable commercials, possible reasons for choice of specific language and visuals).

Language Arts, grades 6–8. The student uses a variety of criteria to evaluate and form viewpoints of visual media (e.g., evaluates the effectiveness of informational media such as websites, documentaries, news programs; recognizes a range of viewpoints and arguments; establishes criteria for selecting or avoiding specific programs).

Explain, define, instruct, report, and communicate information more clearly.

Language Arts, grades K–2. The student understands the main idea or message in visual media (e.g., pictures, cartoons, weather reports, newspaper photographs, visual narratives).

Language Arts, grades 3–8. The student uses strategies in editing and publishing of written works and multimedia. He/she considers format and layout for illustrations, charts, and graphs, and can edit for clarity to address an audience.

Represent, model, depict, and illustrate information.

Mathematics, grades K–2. The student uses a variety of strategies in the problem-solving processes such as draws pictures to represent problems; understands symbolic, concrete, and pictorial representations of numbers; understands that geometric shapes are useful for representing and describing real world situations.

Mathematics, grades 10–12. The student selects and uses the best method of representing and describing a set of data (e.g., scatter plot, line graph, two-way table).

History, grades K–4. The student knows how to develop picture lines of his own life and of his family's history. The student knows the origins and changes in methods of writing over time and how the changes made communications between people more effective (e.g., pictographs, cuneiform, hieroglyphics, alphabets).

Imagine, invent, tell story, entertain, or display information.

History, grades 3–4. The student knows the ways that families long ago expressed and transmitted their beliefs and values through oral tradition, literature, songs, art, religion, community celebrations, mementos, and visual crafts.

Language Arts, grades K–2. The student creates mental images from pictures and print. The student understands the similarities and differences between real life and life depicted in visual media.

Language Arts, grades 6–8. The student understands the use of stereotypes and biases in visual media (e.g., distorted representations of society, imagery, and stereotyping in advertising).

Illustrate navigate, map, chart, diagram, measure, organize, categorize, and classify information.

Mathematics, grades 6–8. The student understands procedures for basic indirect measures (e.g., using grids to estimate area of irregular figures); understands the defining properties of three-dimensional figures (e.g., a cube has edges with equal lengths).

Science, grades 9–12. The student understands how elements are arranged in the periodic table, and how this arrangement shows repeating patterns among elements with similar properties (e.g., numbers of protons, neutrons, and electrons; relation between atomic number and atomic mass).

History, grades 5–6. The student knows the migration and settlement patterns of peoples in the Americas and other regions of the world.

Language Arts, grades 6–8. The student knows how to organize information and ideas from multiple sources in systematic ways (e.g., timelines, outlines, notes, graphic sorting, and relationships).

Plan, predict, forecast, influence, and infer information.

Mathematics, grades K–5. The student understands that one can find out about a group of things by studying just a few of them. He/she understands that spreading data out on a number line helps to see what the extremes are, where the data points pile up, and where the gaps are.

Language Arts, grades K–5. The student uses a variety of strategies to predict content and meaning in visual media (e.g., uses knowledge of the structure of television programs such as cartoons, makes predictions based on program length, knows that a resolution will be reached and that the main character will overcome difficulties to return for the next episode; uses knowledge of cause and effect relationship to predict plot development).

Language Arts, grades 9–12. The student uses a range of strategies to interpret visual media (e.g., draws conclusions, makes generalizations, synthesizes materials viewed, refers to images for information to support point of view, deconstructs media to determine main idea).

Interdisciplinary Approaches, Individual Differences, and Graphic Inquiry

Individual differences among students can be addressed when matching information and content-area standards to the types of graphics used in activities as part of graphic inquiry. For example, a learner who has difficulty with a traditional written science log assignment may be more successful photographing the procedure (see Figure 2, below) or using a chart to trace his progress.

Use picture books to encourage young children to think visually. The book *The Great Graph Contest* by Loreen Leedy introduces students to bar graphs, pie charts, Venn diagrams, and other visual representations through a contest between two amphibian friends who both try to make the best graph. Use online tools such as *Create a Graph* (http://nces.ed.gov/nceskids/createagraph/) and *Grapher* (http://www.ambleside primary.com/ambleweb/mentalmaths/grapher.html) to help students build their own graphs for a class contest (see Figure 3, page 42).

Look for ways to combine standards from different subject areas

Figure 2

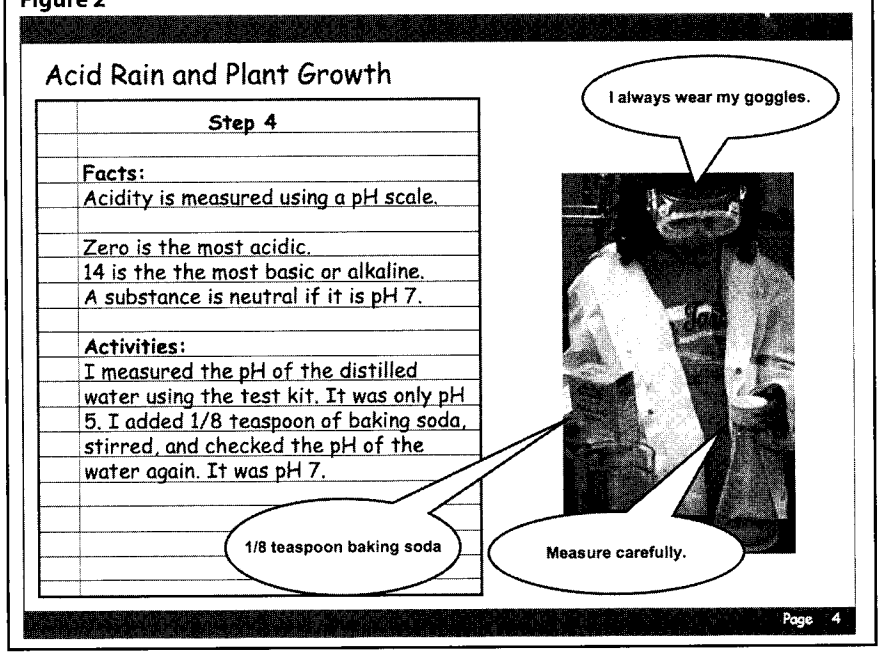
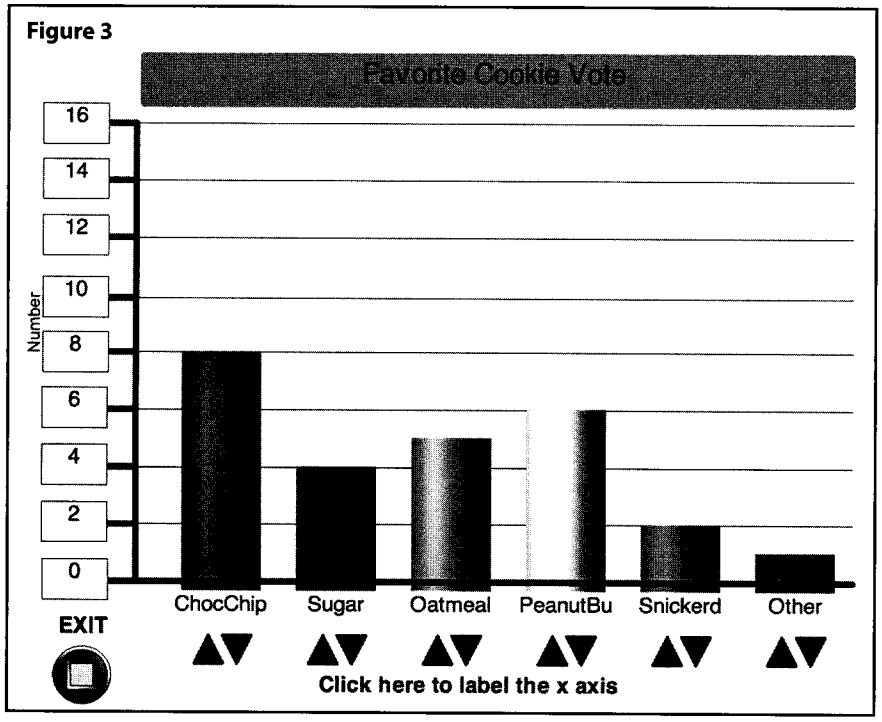
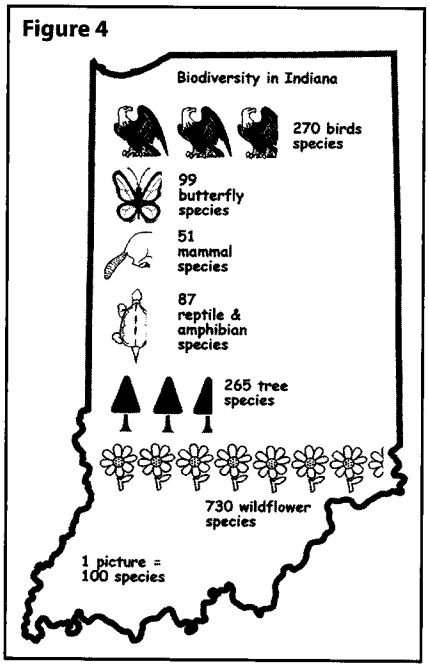


Figure 3



such as language arts, science, and math. For instance, the book *Uno's Garden* by Graeme Base combines the science themes of balance in nature and biodiversity with math topics such as subtraction, multiplication, and prime numbers. Icons are used to represent animals, plants, and buildings in Uno's world. Students can explore their local natural world and represent their findings visually. The website *Enature's ZipGuides* (http://enature.com/zipguides/) can be used to help learners identify the birds, butterflies, mammals, reptiles and amphibians, trees, and wildflowers found in their region. Students can then create their own biodiversity visuals (see Figure 4).

Figure 4



Whether unlocking clues found in a historical photograph or creating a chart comparing reptiles and amphibians, graphics are powerful information resources for students. Below is a list of selected resources to help students think graphically:

Cooke, Donald. *Fun with GPS.* ESRI Press, 2005.
Each year our earth and universe is mapped in more detail and is readily available through the personal computer. This book shows how to keep up with kids who are already mapping their interests in sports, hiking, family history, conservation, animal life, and much more, not only internationally but soon universally.

Hanks, Kurt. *The Rapid Vis Toolkit: An Intriguing Collection of Powerful Drawing Tools for the Rapid Visualization of Ideas.* Crisp Productions, 2003.
This is a highly inviting and contemporary guide to content framing, thumbnail sketches, storyboarding, schematic imaging, future visioning, graphic ideation, and other means to graphically tell stories and get the viewer to really see, imagine, and think.

Moline, Steve. *I See What You Mean.* Stenhouse, 1995.
This book has basic ideas to help the creative elementary school teacher and media specialist create graphic literacy activities that respect the ideas children bring to visually representing their world.

Lohr, Linda L. *Creating Graphics for Learning and Performance.* Merrill Prentice Hall, 2003.
This book is designed for teachers, computer programmers, and those who want to make presentations with sharp, focused illustrations that help the audience retain the main message.

Stein, Harry. *How to Interpret Visual Resources.* Franklin Watts, 1983.
Unfortunately, this book is seen as outdate and, therefore, weeded from many library media centers; this resource is, however, still relevant for thinking through activities that guide kids to extract information from photos, maps, and charts.

Zelazny, Gene. *Say It with Charts.* 4th ed. McGraw-Hill, 2001.
This is a standard guide for executives to convey data visually. It is presented clearly so that secondary school students can easily adapt the design principles given for charts, tables, and other data displays.

References

Kendall, John S., and Robert J. Marzano. *Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education.* 3rd ed. Mid-continent Research for Education and Learning, 2000.

Watch for "Graphic Inquiry: Skills & Strategies, Part II" by Daniel Callison and Annette Lamb in the October 2007 issue of *SLMAM*.